PATENT SPECIFICATION 875,034

DRAWINGS ATTACHED.

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International Classification :—F06k.

COMPLETE SPECIFICATION.

Improvements in or relating to Valves for Fluids under Pressure.

We, REGIE NATIONALE DES USINES RENAULT, a French Body Corporate, of 8/10 Avenue Emile Zola, Billancourt, Seine, France, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement :—

This invention relates to a valve for the passage therethrough of fluid under pressure and is concerned with an improvement in or modification of the invention disclosed in the Specification of our British Patent Application No. 27897/56 (Serial No. 846,271) with particular reference to Figures 1 and 7.

According to the present invention there is provided a valve for the passage therethrough of fluid under pressure, said valve including a housing which defines a substantially cylindrical internal chamber and which is formed with an inlet and an outlet at opposite axial ends of said housing, and a piston-like unit in said housing mounted for axial sliding movement along the cylindrical wall of said chamber so that, upon fluid under pressure flowing from the inlet towards the outlet, the piston-like unit is displaced under the action of the fluid towards the outlet to close off vent means formed in said housing which normally provides communication between the outlet and the atmosphere, and so that, upon interruption of said flow and due to residual fluid pressure subsisting at the outlet side of the piston-like unit, the latter can be displaced towards the inlet to open said vent means and enable residual fluid pressure to be vented therethrough, said piston-like unit comprising a core over which is tensioned a cup-shape valve member made of elastomeric material whose bottom, located at the outlet end of the piston-like unit is formed by a centrally perforated diaphragm which is normally urged by its inherent tension against a seating surface of the core to close off a plurality of passages formed in said core and opening in said seating surface so as to preclude a return flow of fluid from the outlet towards the inlet, and which is lifted off said seating surface upon fluid under pressure flowing through said core from the inlet towards the outlet.

For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made to the accompanying drawings in which the three figures are axial sections of three different embodiments of a valve according to the invention, the two halves of each figure illustrating two different phases of operation.

It will be noted that in each figure the same reference numerals have been employed to designate corresponding parts.

The valve illustrated in Figure 1 comprises a housing consisting of a cup-shaped part 1 formed with an axial nozzle or inlet 2 adapted to be connected to a source of fluid under pressure, for example an air compressor, and of a cup-shaped part 3 which is screwed over the part 1 until the rounded rim 5 of the latter engages the bottom 27 of the part 3, and which is formed with a nozzle or outlet 4 which is adapted to be connected to supply, for example, pneumatic apparatus. The housing thus defines an internal cylindrical chamber in which is enclosed a piston-like unit.

This piston-like unit consists of two parts : a bulbiform core 25, and a cup-shaped valve member 12, made of elastomeric material, which is tensioned over the core 25.

The bottom of the cup-shaped valve

[*Price*

member 12 is constituted by a diaphragm 19 formed with a central opening. This diaphragm is normally urged by inherent tension of the elastomeric material against a conical seating surface 20 of the core 25 so as to close off a circular series of equally spaced axial passages 26 opening in the seating surface 20 and communicating with a large axial bore 21 opposite inlet 2.

The cup-shaped valve member 12 is also provided with a circumferential lip 22 and with several circumferential ribs 23, which engage the internal cylindrical surface of the circular wall of the cup-shaped housing part 1 so as to prevent fluid under pressure from flowing between this wall and the valve member.

The cup-shaped valve member 12 is moreover provided at its axial end nearest the outlet 4 with a circumferential bead 30 which also engages the internal cylindrical surface of the housing part 1. This bead 30 serves to close off a circular series of equally spaced axial vent ports 31 extending through the bottom 27 of the cup-shaped housing part 3. Since the rounded rim 5 engages the bottom 27 and therefore restricts to a large extent the inner end of the ports 31, the bead 30 will engage both the bottom 27 and the rim 5 when the piston-like unit occupies the position shown in the lower half of Figure 1 and will be pressed into the recess defined between the bottom 27 and the rim 5, thus ensuring proper seating of the ports 31.

The outer ends of these ports 31 are protected against the ingress of dust and other foreign matter by the lip 24 of a circular gasket 32 made of elastomeric material and held in position by a toroidal bead imbedded in an annular recess at the root of the nozzle 4.

The rim of the cup-shaped valve member 12 adjacent the inlet overlaps the adjacent end of the core 25 so as to prevent the latter from abutting against the bottom 29 of the housing part 1 when the piston-like unit occupies the position shown in the upper half of Figure 1.

The operation of the device is as follows: When the valve is connected up, and upon, say, compressed air being supplied to the valve through the inlet 2, the piston-like unit is first moved to the right by the compressed air and the bead 30 closes off the ports 31, whereupon the diaphragm 19 is distended by the compressed air acting through the axial bore 21 and the passages 26 in the core and is bent outwards about a circular groove formed on the inside of the diaphragm acting as a hinge, thus enlarging its central opening which allows the compressed air to flow through to the outlet 4. Upon being fully distended, the diaphragm 19 will be pressed against a circular bead 28 on the bottom 27 and against the conical surface of a flared mouth of the outlet 4, thus supplementing the action of the bead 30 in sealing the ports 31.

When the supply of compressed air has been interrupted, the pressure at the inlet end of the chamber drops and the diaphragm 19 contracts and is restored against the seating surface 20 of the core thus closing off the passages 26. Any residual pressure subsisting at the outlet side of the piston-like unit will cause the piston-like unit to move axially towards the inlet thereby causing the bead 30 to uncover the ports 31. The residual compressed air in the outlet 4 can then escape to the atmosphere through the ports 31 and by the raising of the lip 24 of the gasket 32.

Figure 2 illustrates a valve which is identical in all respects to the valve shown in Figure 1 except that it comprises, in addition, a small leakage hole 33, which extends through the bottom 29 of the cup-shaped housing part 1 and which is covered by a diaphragm 34 secured to the housing part 1 and made of flexible material. Upon interruption of the supply of compressed air to the valve, the hole 33 serves to vent residual compressed air at the inlet side of the piston-like unit thus enabling a speedier displacement of the piston-like unit towards the inlet when residual compressed air remains at the outlet side of the piston-like unit. This speedier displacement of the piston-like unit will consequently hasten the uncovering of the ports 31 and hence the venting of the residual compressed air at the outlet side of the piston-like unit.

The presence of this hole 33 will necessarily entail a certain leakage during flow of compressed air through the valve from the inlet to the outlet. However, the size of the hole 33 is made sufficiently small so as not to impede the operation of the valve.

Figure 3 illustrates a valve assembly in which the housing consists of three parts: a substantially cylindrical part 36 divided by a wall 45 so as to have a substantially H-shaped axial section, a first cup-shaped part 35 similar to the part 3 in Figures 1 and 2 screwed over the upper half of part 36 until the rounded rim of this upper half engages the bottom of this first cup-shaped part, and a second cup-shaped part 37 screwed over the lower half of part 36 until the rim of this lower half engages in an annular groove formed in the bottom of the cup-shaped part 37.

The upper half of the part 36 and the cup-shaped part 35 screwed thereover define a cylindrical chamber in which is mounted a piston-like unit identical to that shown in Figures 1 and 2. The constructional features and the operation of the upper part of the present valve assembly are thus substantially identical to those of the valve shown in

Figure 2. It will be noted, however, that the hole 33 extends in the present embodiment through the cylindrical wall of the housing part 36.

The lower part of the valve assembly defines an auxiliary valve for speeding up still further the evacuation of any residual fluid pressure at the outlet side of the piston-like unit of the valve in the upper half of the assembly.

This auxiliary valve comprises a resilient valve member 42 having a toroidal portion 41 clamped in an annular pocket defined by the inner surface of the lower part of the cylindrical wall of the housing part 36, the underface of the dividing wall 45, a circular rib 43 formed on this underface around a flared mouth of an axial passage 46 extending through the dividing wall 45, the bottom 40 of the cup-shaped housing part 37, and the outer cylindrical wall of a boss 38 projecting axially from the inlet 2 towards the passage 46.

The top of the boss 38 defines a conical seating surface against which a diaphragm 44 of the valve member 42 is normally pressed by inherent tension of the diaphragm material to close off a circular series of equally spaced passages 39 opening in the conical seating surface and communicating with a bore 47 extending from the inlet 2 through the bottom of the cup-shaped housing part 37 and into the boss 38.

When gas under pressure is supplied to the inlet 2, the gas flows along the bore 47 and through the passages 39 thereby lifting the diaphragm 44 off its conical surface and bending the diaphragm upwards about the rib 43 until it engages the conical surface of the flared mouth of passage 46 whereby the central opening formed in the diaphragm is distended to allow the passage of the gas therethrough. The gas then flows through the passage 46 and through the main valve in the upper half of the assembly as described with reference to Figure 1.

When the supply of gas under pressure is interrupted the diaphragms of the main and auxiliary valves close off passages 26 and 39 respectively. Since the volume of gas between these two diaphragms is relatively small, any residual pressure in this gas which might slow down the downward movement of the piston-like unit under the action of pressure acting on the unit at the outlet side thereof can be rapidly relieved through the hole 33 in communication with the atmosphere. If the pipe connecting the inlet 2 to the source of gas under pressure is relatively long, the present valve assembly would be more advantageous than the valve shown in Figure 2, since it will not be necessary to relieve the residual pressure of what might be a substantial volume of gas. The return movement of the piston-like unit of the main valve and hence the uncovering of the vent ports 31 can thus be speeded up.

WHAT WE CLAIM IS:—

1. A valve for the passage therethrough of fluid under pressure, said valve including a housing which defines a substantially cylindrical internal chamber and which is formed with an inlet and outlet at opposite axial ends of said housing, and a piston-like unit in said housing mounted for axial sliding movement along the cylindrical wall of said chamber so that, upon fluid under pressure flowing from the inlet towards the outlet, the piston-like unit is displaced under the action of the fluid towards the outlet to close off vent means formed in said housing, which normally provides communication between the outlet and the atmosphere, and so that, upon interruption of said flow and due to residual fluid pressure subsisting at the outlet side of the piston-like unit, the latter can be displaced towards the inlet to open said vent means and enable said residual fluid pressure to be vented therethrough, said piston-like unit comprising a core which is tensioned a cup-shaped valve member made of elastomeric material whose bottom, located at the outlet end of the piston-like unit, is formed by a centrally perforated diaphragm which is normally urged by its inherent tension against a seating surface of the core to close off a plurality of passages formed in said core and opening in said seating surface so as to preclude a return flow of fluid from the outlet towards the inlet, and which is lifted off said seating surface upon fluid under pressure flowing through said core from the inlet towards the outlet.

2. A valve as claimed in Claim 1, wherein a small leakage hole is made in the wall of the housing at a location such that fluid under pressure, on the inlet side of the piston-like unit, tending to oppose axial displacement of the piston-like unit towards the outlet upon interruption of the flow of fluid, can be vented.

3. A valve as claimed in Claim 2, further comprising an auxiliary valve member between the inlet and the cylindrical chamber, said auxiliary valve member being arranged to open upon flow of fluid under pressure from the inlet towards the outlet and to close upon interruption of said flow, so that the volume of pressured fluid opposing the displacement of the piston-like unit towards the outlet upon said interruption can be

reduced and more rapidly vented through the leakage hole.

4. A valve for the passage therethrough of fluid under pressure substantially described with reference to any one of Figures 1 to 3 of the accompanying drawings.

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Fig.1

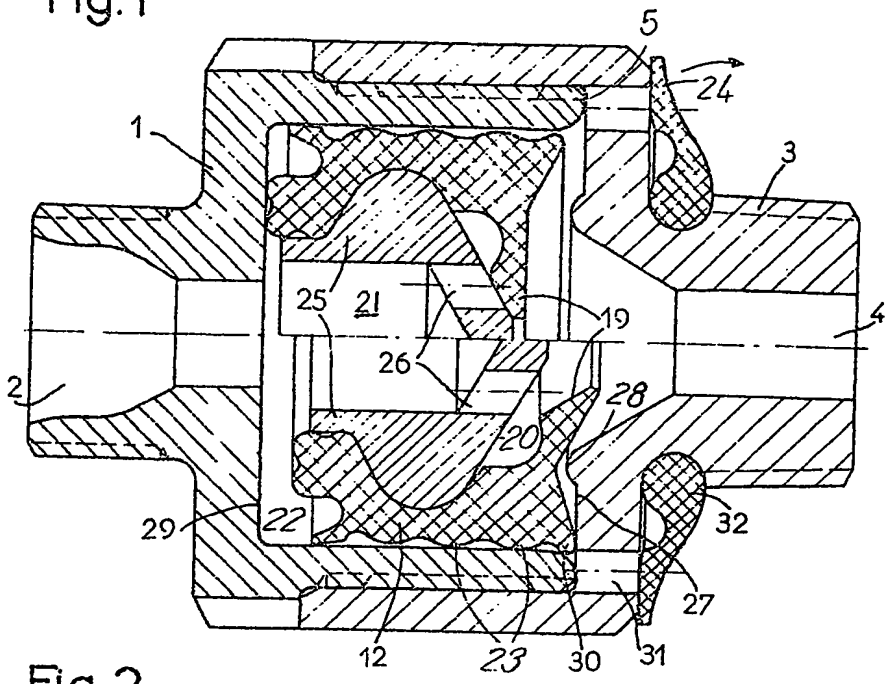
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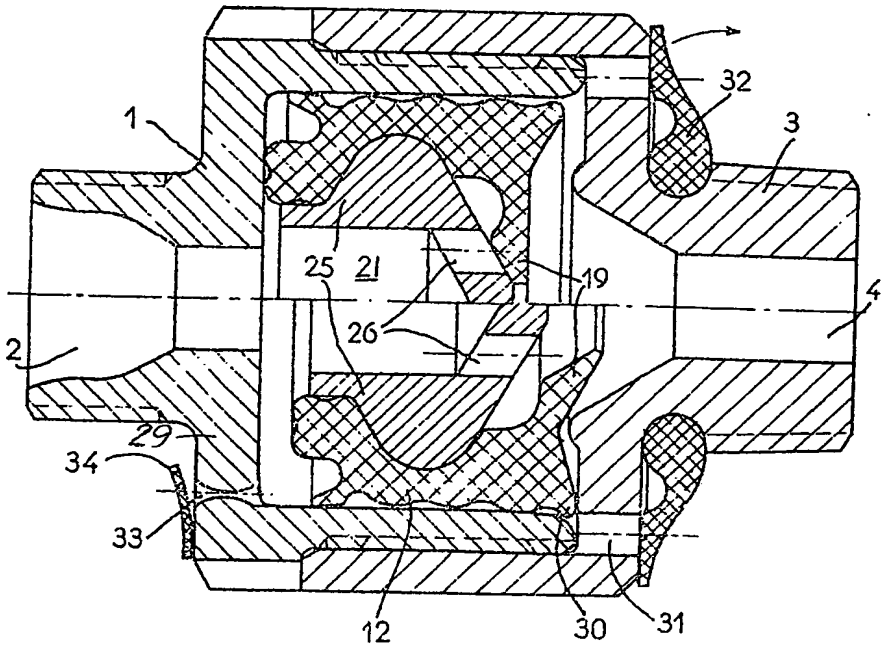
Fig.2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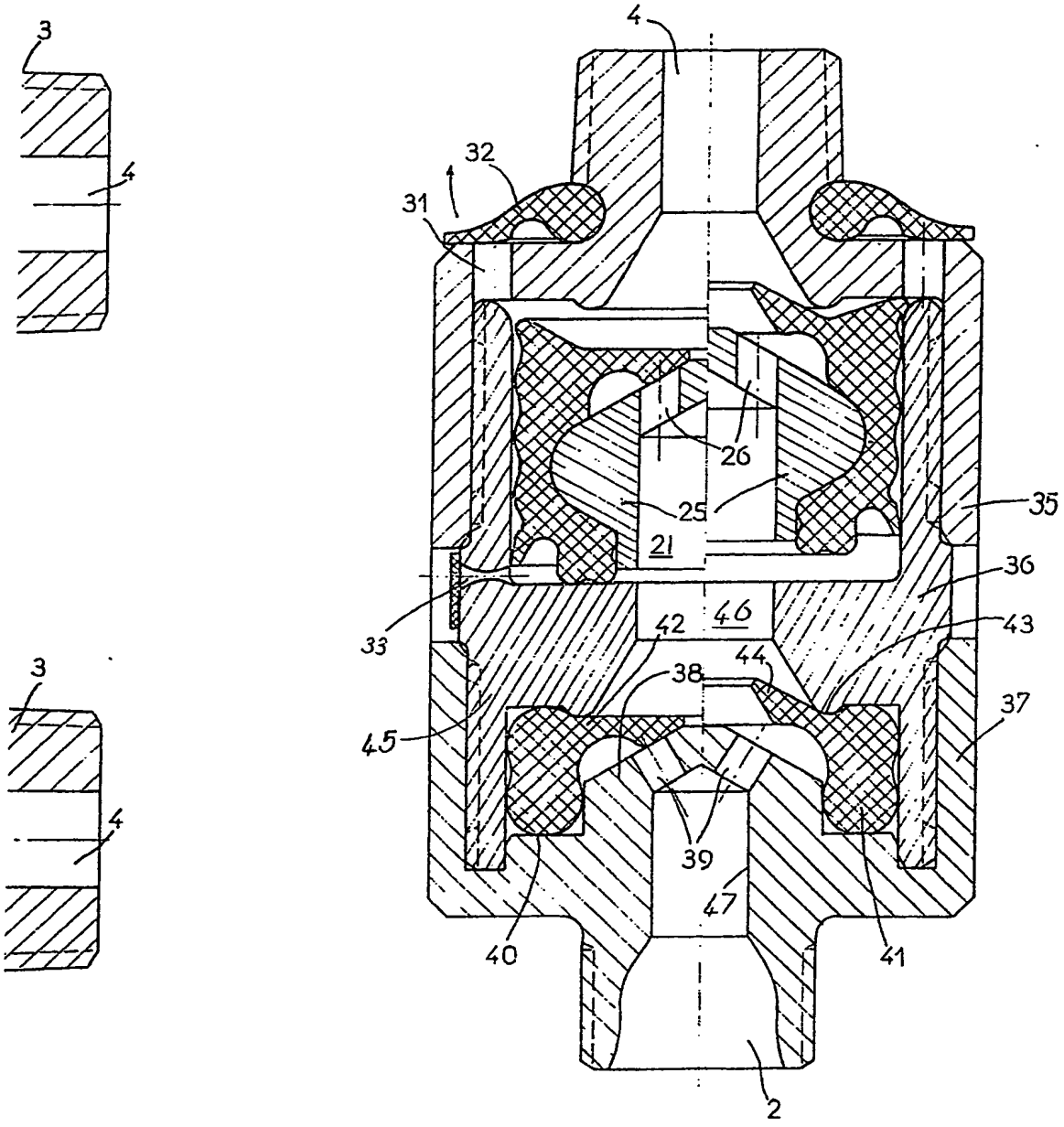
875,034 COMPLETE SPECIFICATION
2 SHEETS This drawing is a reproduction of the Original on a reduced scale.
SHEETS 1 & 2

Fig. 3



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SHEETS 1 & 2

Fig.1

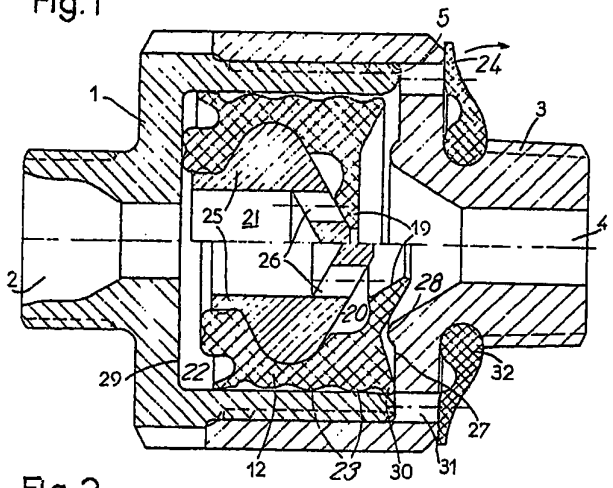

Fig.2

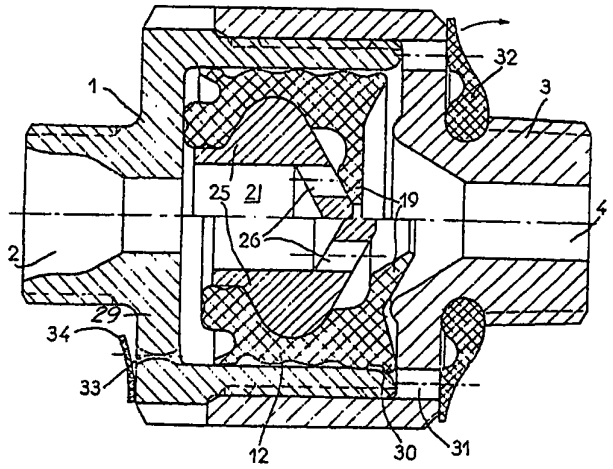

Fig. 3